CPSC 1155 – Lab 9

Midterm Review

Lab Introduction

This lab helps you practice for your midterm. There is no submission for this lab.

Practice Questions

1. For each of the following, write C++ statements to calculate '`output`' (as a double value) using C++ mathematical functions. Determine the limitations on input values (x, y, z) to ensure valid output values.

   a. output = $\frac{3+4x}{x+5} - \frac{10(y-4)(y*x^2)}{5} + 9(\frac{4}{x} + \frac{\sqrt{x+y}}{12})$

   b. output = $9.5 * (x + 5.5)^{2.5+y}$

   c. output = $e^{-x} + \sqrt{e^{-x}} + e^{-\sqrt{x}}$

   d. output = $xln(x) + x(log_{10}(x)) + \sqrt[3]{x}$

   e. output = $y\frac{\sin(x)}{x} + x\frac{\sin(y)}{y}$

   f. output = $1 + x + x^2 + x^3 + \cdots + x^n$ (for n = 99)

   g. output = $x - \frac{x^3}{3!} + \frac{x^5}{5!} + \cdots + \frac{x^n}{n!}$ (for n = 99)

2. Given the following pseudocode, assume x is an input. For each specified printout, write the possible range of values of x in the space provided (e.g.: 5 < x <= 6)

```
int x;
cin >> x;
if (x > 0){
  if (x < 45)
    cout << '1';
  else
    if (x > 120)
      cout << '2';
}
```

output	range of x
1	
2	
nothing	

3. What data types are required for a switch variable? What are the advantages of using a switch statement? Can you always convert a switch statement to an equivalent if statement, or vice versa? If the keyword break is not used after a case is processed, what is the next statement to be executed? How can you implement compound conditions (with logical operators (&& and ||)) in a switch statement?

4. Rewrite the following statements using switch:

```
a. if (x == 5 && y == 6)
     cout << x + y;

b. if (x == 5 || y == 6)
     cout << x - y;
```

```
c. if (x == 5 || x == 6)
     cout << x ;
   else
     cout << "end" ;
```

5. Given the input values for x, y, and z, determine their values after the following switch statement is executed. Assume all the required libraries are included.

```
int x, y = 2, z = 5;
cin >> x;
switch (x - y) {
  case 0: z -= x + y++; break;
  case 2: z /= x * y--; break;
  case 3: x = (double) (x / y);
  case 5: z = pow(x, y * 0.5); break;
  case 6: z = sqrt(x / y);
  default: y += floor((--x) / y);
}
```

input value	x	y	z
x = 2			
x = 4			
x = 5			
x = 8			

6. What is the output of the following program for different values of x, y, and z. Rewrite the program replacing switch statements with if / else.

```
int x, y, z;
cin >> x >> y >> z;
switch (x){
  case 5:
    switch(y) {
      case 6:
        cout << x + y << endl;
        break;
      default:
        cout << x - y;
    }
    break;
  default:
    switch(y) {
      case 6:
        cout << x - y << endl;
        switch(z) {
          case 2:
            cout << z << endl;
            break;
          default:
            cout << z - y << endl;
        }
        break;
      default:
        cout << x << " " << y << " " << z;
    }
}
```

7. How do you create an object for reading data from file test.txt? How do you create an object for writing data to file test.txt? Can you create a file object and open it in one statement? What happens if the file already exists when you open a file for output? What happens if your program needs to read data from a file, but the file does not exist?

8. For each of the following, write a single statement that generates the exact random integers.

   a. -5, -2, 1, 4, 7, 10, 13, 16, 19, 22

   b. 0, 5, 10, 15, 20, 25, …, 100

9. Rewrite the following C++ loop with a do-while and a conditional operator (_?_:_). The loops must generate the same printout for a given value of x. [Hint: Test both codes with numbers]

```
int x;
while (--x >= 1)
  cout << (x % 2 ? "even " : "odd ");
```

10. (Loops) Convert the following loops from a) while to for b) for to while.

a.
```
int i = 0, sum = 0;
while (sum < 10000){
  sum = sum + i;
  i++;
}
```

b.
```
for (int i = 0; i < 4; i++){
  if (i % 3 == 0) continue;
  sum += i;
}
```

11. (Nested Loops) For each of the following, write a trace table and determine the printouts.

a.
```
int i, j;
for (i = 4; i < 7; i++) {
  cout << i << ' ';
  for (j = 1; j <= i; j++) {
    int x = i * ++j;
    if (x > 0)
      cout << i * j << ' ';
  }
  cout << j << endl;
}
```

b.
```
for (int i = 1; i < 10; i++) {
  cout << i << ' ';
  for (int j = i; j >= 0; j--) {
    int x = i++ * j;
    cout << i * j << ' ';
  }
  cout << j << endl;
}
```

c.
```
for (int i = 4; i < 7; i++) {
  for (int j = 0; j < 4; j++) {
```

```
        int x = i * ++j;
        if (x > 0)
          cout << i * j << ' ';
      }
      cout << i << endl;
    }
```

d.
```
int x, count = 0;
for (int x = 0 ; x <= 5 ; x++)
  for (int y = 0; y <= x; y++)
    count++;
cout << count;
```

e.
```
int x, count = 0;
for (int x = 0 ; x <= 5 ; x++)
  for (int y = 0; y <= x; y++
    if (x * y < 3)
      count++;
cout << count;
```

12. Identify and correct the errors in the following code segments.

a.
```
//swap x1 and x2
int x1 = 1, x2 = 3, temp;
x1 = temp;
temp = x2;
x2 = x1;
```

b.
```
//reverse a string
string word = "abcdefgh";
int j;
for (int i = 0; i < word.length(); i++) {
  j = word.length() - i;
  word[j] = word[i];
}
```

c.
```
//count the number of win/loss for one guess and 6 rolls of dice
int x = srand(time(0));
int guess, countLoss, countWin; cin >> guess;
for (int i = 1; i <= 6; i++)
  if ((1 + rand() % 6) == guess)
    countWin++;
  else if ((1 + rand() % 6) != guess)
     countLoss++;
cout << countLoss << " " << countWin;
```

Problem Statements

13. (Search a String) You are required to search a string for a character.

    Write a program that reads a string and a character, searches for the character, and displays all the indices that the character occurs.

Here are sample runs:

```
Enter a string: programming
Enter a character: g
'g' occurs at 3 and 10
```

```
Enter a string: programming
Enter a character: b
'b' does not exist
```

14. (Dice Rolling) Write a **C++ program** that allows the user to roll two dice (random numbers).
    a. If the dice values are not the same in the first roll, the user loses.
    b. If the dice values are equal, the user is allowed to roll again.
    c. If the dice values are not equal in the second roll, the user wins $5.
    d. If the dice values are the same in the second roll, the user wins $10.
    e. If the dice values are the same as the values in the first roll, the user wins $50.
    f. The program displays an appropriate message for each situation.

    Here are sample runs:

```
first roll: 2 and 3
You lost!
```

```
first roll: 4 and 4, second roll: 2 and 6
You won $5!
```

```
first roll: 4 and 4, second roll: 2 and 2
You won $10!
```

```
first roll: 4 and 4, second roll: 4 and 4
You won $50!
```

15. (Pattern) Write a program that takes n as the number of rows and displays a pattern with n rows. (Hint: For each row, first create the spaces, then print the stars.)

    Here is a sample run with n = 6:

```
* * * * * *
  * * * * *
    * * * *
      * * *
        * *
          *
```